# CHAPTER 7.2
# PUMPS, PIPING, VALVES AND TANKAGE

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7.2-1. GENERAL. Pumps, piping, valves, and tanks should be pressure and leak tested in accordance with the specifications. Care should be taken to ensure that the specified testing pressure is used. Fifty percent over maximum operating pressure is often selected to provide an adequate factor of safety. If hydraulic surges are a system possibility, the test pressure should reflect the anticipated maximum surge pressure plus a factor of safety. It is especially critical to verify that all equipment that contains acids or bases is constructed according to specifications. Failure to do this could result in serious equipment failure and injury. Secondary containment systems should be leak tested prior to acceptance.

7.2-2. PROCESS PIPING AND VALVES.

a Pressure Testing. When pressure/leakage testing double wall piping, ensure that an acceptable method for pipe repair has been defined in the event the carrier pipe or containment pipe does not meet pressure testing requirements.

b. Pipe Layout. The specifications should require the contractor to provide an as-built pipe legend which defines pipe type (air, process water, potable water, chemical feed, etc.) with respect to color and pipe labeling. For example, process water may be labeled as “PW” on a green pipe. This should be reflected on the pipe legend. Ensure that there is no cross connection between process water, fire protection water, and potable water. Process water is the non-potable water that is typically utilized for general house-keeping activities, wash down, backwash water, pump seal water, and cooling. Non-potable water is utilized as process water to reduce overall water consumption within a treatment facility. Piping should be laid out to allow ample room for maintenance and removal of equipment.

c. Piping Schedule. It is critical that the contractor complies with the plans and specifications for pipe sizes, materials of construction, interior linings, exterior coatings, thickness class, secondary containment, insulation and freeze protection, joint and pressure test requirements, and listed standards. Typically, a piping schedule is provided by the designer for clarity. The piping schedule should define all piping used in the treatment facility, including air, process water, potable water, and chemical feed. The actual layout of the piping in the building is field determined and will be submitted by the contractor for approval.

d. Process Valves, Flow Meters, and Miscellaneous Appurtenances. Ensure that the contractor provides valves, flow meters, and appurtenances of the same type and by the same manufacturer to the greatest extent possible. The design package should contain a valve schedule and labeling system for ease of construction.

e. Shop Drawings. Accurate, contractor provided, shop drawings for piping, valves and appurtenances are critical. The valve schedule/labeling system is important to allow the contractor to provide complete, concise shop drawings.

f. Variations. As construction progresses, and the piping

systems come together, there will be many small changes in piping configuration and location of appurtenances which may require the designer's approval. The majority of the time, these changes are a result of variations in prefabricated equipment, ease of installation, improved O&M, safety, etc. These changes will ultimately result in a better overall product. It is very important that these variations are documented on the shop drawings daily and checked by the QA Representative weekly.

7.2-3. PROCESS/SLUDGE PUMPS AND BLOWERS.

a. Process and Sludge Pumps. A variety of pumps and blowers are required for a ground water treatment system. Typically, a pump schedule is provided in the plans and specifications to indicate pump use, type, flow and head requirements.

(1) Verify that blowers and pumps are the specified size.

(2) Verify that the pump rotation is correct by bumping the motor (briefly turning the pump on).

(3) Verify the pump and motor are aligned according to the specified procedures prior to operation.

b. Seal Water. Determine if seal water must be provided to cool bearings or seals in any of the pumps. A drain must also be provided if seal water is required.

c. Pump Pads. Pump pad locations should be defined on the contract drawings. Ensure that pumps are leveled during installation on the pad.

d. Diaphragm Pumps. For diaphragm pumps, ensure that the air feed to the pump is of adequate quality. This may require the installation of a dryer system to prevent freeze-up. Check the vendor literature to determine if a particulate filter and lubricator are required.

e. Factory and Field Testing. Following installation, it is the contractor’s responsibility to ensure that the pumps are tested for operability. The supplier normally provides performance curves for the pumps.

f. Blowers. Blowers may need to be balanced to prevent vibration. Large blowers may require anti-surge protection, flexible piping connections, and vibration isolation of the foundation.

7.2-4. PROCESS TANKS AND TOWERS.

a. Coatings and Nozzles. Coatings and linings as well as pipe nozzle sizes and locations should be shown on the shop drawings and verified on the tanks when delivered.

b. Supports. Ensure that adequate external support per the specifications is provided for tanks over 1 meter (3 feet) tall and for elevated tanks.

c. Carbon Steel Tanks and Towers. Check that the tank finish conforms with the required mil thickness (if painted). Verify that the primer is compatible with the paint. Sandblasting is often

required prior to painting. Review the specifications to determine what type of material should be used for blasting and what finish (near-white versus white) is required.

d. Paint Defects. Inspect for abrasions on all painted surfaces. Require the contractor to repair any abrasions, cuts, and scratches.

e. Footings. Verify that footings and anchor bolts are constructed according to the specifications.

f. Large Tank Construction. Ensure that all sections of the tank shell have been accurately rolled and do not have a “dished” or “egg-shape” appearance.

g. Pressure Tanks. Verify that tanks which will be pressurized are designed, constructed, and tested in accordance with applicable ASME pressure codes. Verify the ASME seal is present on the tank name plate.

h. Operations and Maintenance.

(1) Inspect pumps, piping, valves and tankage for leaks and corrosion.

(2) Ensure the contractor is routinely removing sand and other material from tanks and towers.

(3) Tank site glasses need to be checked periodically to determine tank liquid levels and verify automated tank liquid level sensors are functioning properly.